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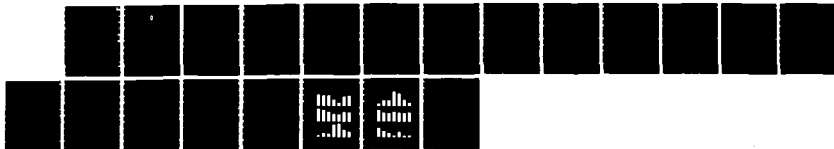
MOOD STATES AT 1600 AND 4300 METERS TERRESTRIAL  
ALTITUDE(U) ARMY RESEARCH INST OF ENVIRONMENTAL  
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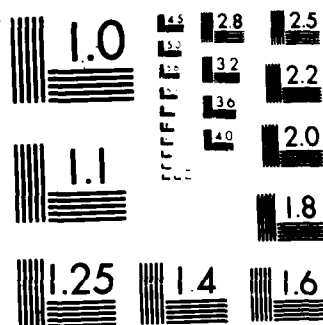
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Personal anecdotes suggest that ascent to high altitude can cause mood changes such as depression, apathy, and drowsiness. Behaviors at high altitude indicate that people can become more argumentative, irritable, or euphoric. Since there are few systematic and quantitative studies assessing the effects of altitude on mood, this study compared moods at two different altitudes and times of day (morning - evening) using a standardized scale.

The Clyde Mood Scale was used twice daily to determine self-rated moods in 19 males and 16 females. Baseline values were determined at 200m; moods were then assessed at 4300 m with one group and at 1600 m with a second group.

Friendliness, clear thinking, dizziness, sleepiness, and unhappiness were affected at 4300 m. Only sleepiness changed at 1600 m. At 4300 m, moods differed from baseline on the day of arrival (1 - 4 hours), differed even more after one day (18 - 28 hours), and returned to baseline levels by day 2 (42 - 52 hours).

Morning and evening values did not differ at 200, 1600, and 4300 m, except for

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sleepiness at 4300 m. Therefore, mood states have a characteristic time course at altitude which is similar to that for acute mountain sickness symptomatology.

TITLE: Mood States at 1600 and 4300 Meters Terrestrial Altitude

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RUNNING HEAD: Mood States at Altitude

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## ABSTRACT

Personal anecdotes suggest that ascent to high altitude can cause mood changes such as depression, apathy, and drowsiness. Behaviors at high altitude indicate that people can become more argumentative, irritable, or euphoric. Since there are few systematic and quantitative studies assessing the effects of altitude on mood, this study compared moods at two different altitudes and times of day (morning - evening) using a standardized scale.

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Index terms: affective states, Clyde Mood Scale, acute mountain sickness

When unacclimatized individuals are exposed to high terrestrial elevations (above 3000 m) for prolonged periods (several hours to days), they often experience considerable subjective discomfort as well as some functional disability. This disorder is referred to as acute mountain sickness (AMS). AMS is characterized by symptoms such as headache, dizziness, loss of appetite, nausea, fatigue, insomnia, irritability, depression, and difficulty with thinking (4,11). The number, severity, rapidity of onset, and duration of AMS symptoms vary from person to person and are related to both level of altitude and rate of ascent. Generally, AMS symptoms are most severe during the first or second day at altitude and then gradually recede over the next 2 - 4 days (4,10,16). Symptom occurrence and severity have been assessed in past studies with two inventories, the General High Altitude Questionnaire (GHAQ) and the Environmental Symptoms Questionnaire (ESQ) (6,12,13,14).

Unfortunately, no standardized scale has been utilized to measure mood changes at altitude. Personal anecdotes suggest that ascent to altitudes between 2500 - 5500 m produce two predominant reactions - euphoria and depression. Euphoria is accompanied by a feeling of self-satisfaction as well as a sense of power and is followed later by depression. With time at altitude, the person also may become quarrelsome, irritable, and apathetic (1).

A previous investigation by Evans et al. (7) examined whether a combination of staging (temporary residence for a few days at a moderate altitude before ascent to a higher altitude) plus the administration of acetazolamide would improve AMS symptomatology at altitude. They found that almost all symptoms of AMS were prevented at 4300 m by this treatment strategy (85% reduction). Acetazolamide has also been investigated as the sole pretreatment for AMS in previous studies (3,9).

In the same study by Evans et al. (7), Banderet (1) assessed mood

periodically at 1600 and 4300 m but only reported 19 hour values; AMS symptoms are usually greatest at this time. People in both the control and treatment groups were less friendly and clear thinking and more sleepy and dizzy at 4300 m. No mood changes were found at 1600 m. Thus, Banderet showed mood changes at 4300 m and demonstrated that the Clyde Mood Scale was sensitive to these changes.

Since only effects occurring 19 hours after ascent were reported by Banderet, this study examined the time course of mood states using the earlier data base (1); i.e. changes in mood throughout a period of two days at 1600 m and a period of four days at 4300 m. Time (morning - evening) differences in mood were also examined.

#### MATERIALS AND METHODS

Subjects: The subjects were 16 female and 19 male fully-informed volunteers, ranging in age from 18 to 28 years, from Fort Sam Houston, Tx (200 m). All were medically screened. Prospective subjects were excluded if they were born at an altitude over 1000 m, had resided for more than 1 month at an altitude over 1000 m in the last 3 years, or had sojourned to an altitude over 3000 m within the 3 months prior to the study.

Mood questionnaire: The Clyde Mood Scale (5) was used to assess the subjects' moods. This scale was designed to measure human emotions. It consists of 48 adjectives - e.g. "kind", "dependable", "alert", "lonely", "tired" - rated on a four-point scale, i.e. "not at all", "a little", "quite a bit", and "extremely". Prior statistical analysis has shown that the 48 adjectives cluster into 6 principal mood factors - friendliness, aggressiveness, clear-thinking, sleepiness, unhappiness, and dizziness. Its sensitivity to the effects of high altitude upon mood has been shown (1,2).



Procedures: As stated above, the present study was part of a larger investigation. (7) in which subjects were randomly assigned to the control (n = 17) or treatment (n = 18) group and then studied for 2 weeks at 200 m. The control group then proceeded from 200 to 4300 m (Pikes Peak, Co) within 5 hours by a combination of pressurized commercial aircraft and cars. The treatment group proceeded in pressurized aircraft to 1600 m (Denver, Co) and were staged at this altitude for 4 days before proceeding to 4300 m. In addition to the 4 days of staging at 1600 m, the treatment group received acetazolamide for the last 2 days at 1600 m. All subjects received tablets (placebo or acetazolamide) each day of the study to minimize placebo effects. Only those days during which the subjects received placebo are reported.

Subjects' moods were self-rated twice daily using the Clyde Mood Scale administered in a computer card, Q-sort format (to facilitate scoring). Moods were assessed initially on days 9 and 10 of the study at 200 m, and then each day at 1600 m and 4300 m. The mood scale was always administered after the morning (8:00 a.m.) and evening (6:00 p.m.) meals, except on the day of arrival at 1600 and 4300 m the first administration was given just after ascent (2:30 p.m.).

Morning and evening values for each principal mood factor were calculated for every administration at 200, 1600, and 4300 m. A two-way repeated measures analysis of variance was used to analyze day, time of day, and interaction effects. A separate analysis of variance was run for each factor at each altitude. Paired t-tests were used to analyze baseline - altitude differences. A more rigorous significance level,  $p \leq .01$ , was chosen to compensate for the number of multiple comparisons used to analyze the data.

## RESULTS

Shown in Table I are the daily morning and evening factor scores for each altitude. No differences were found between the morning and evening (AM and PM) administrations on any of the factors at 200, 1600, and 4300 m, except on the sleepiness factor at 4300 m. Therefore, morning - evening values were pooled to produce an average daily value. Also, no daily differences were found at 200 m, except for on the unhappiness factor (subjects were happier on day 10 than on day 9,  $p \leq .01$ ). Since we suspected this difference was situationally specific, i.e. attributable to the anticipation of going to Colorado, we calculated a baseline value for each factor by averaging the four administrations at 200 m for both groups (no differences were found between groups).

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Table I about here  
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Figures 1 and 2 show the daily value for each mood factor at 200, 1600, and 4300 m. The day 0 value reflects the day of ascent to high altitude, day 1 the first full day at altitude, etc. The scores for 200 m are the values for all subjects for the last two days at sea level. Values for 1600 m were obtained from the treatment group mean scores on day 0 and day 1 when placebo was given. Values for 4300 m were obtained from the control group mean scores on day 0 - day 3. Mood states significantly different from baseline are marked with a double asterisk.

Mean scores for friendliness are shown in Figure 1. Daily scores at 4300

m were significantly different ( $p \leq .0001$ ). Values at 4300 m were less on day 0 ( $p \leq .002$ ) and day 1 ( $p \leq .001$ ) than at 200 m. By day 2 friendliness was similar to that at 200 m. Friendliness did not change at 1600 m. Clear thinking scores are also shown in Figure 1. Subjects were less clear thinking at 4300 m on day 0 ( $p \leq .005$ ) and on day 1 ( $p \leq .004$ ) than at 200 m. Clear thinking returned to its original value by day 2. Again, no altitude effects were found at 1600 m. Figure 1 also shows the mean scores for the dizziness factor. Daily scores were significantly different ( $p \leq .001$ ) at 4300 m. On day 0 and day 1, subjects felt more dizzy at 4300 m ( $p \leq .002$  and  $p \leq .001$ , respectively) than at 200 m. No altitude effects for dizziness were shown at 1600 m.

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Figure 1 about here

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Sleepiness mean scores are shown in Figure 2. At 4300 m there was a significant day effect ( $p \leq .0001$ ) and a significant time effect ( $p \leq .001$ ) on the sleepiness factor. The morning sleepiness score was significantly greater than the evening score on day 3 ( $p \leq .0001$ ); perhaps an "end-spurt effect" (produced by the anticipation of the end of the study) revitalized the subjects on this particular administration. Other time of day differences were not significant. Subjects were more sleepy on day 0 ( $p \leq .0001$ ) and on day 1 ( $p \leq .002$ ) at 4300 m than at 200 m. By day 2, however, sleepiness had recovered. At 1600 m, subjects also reported themselves as more sleepy on day 0 ( $p \leq .008$ ). This change was the only difference found at 1600 m. There were no differences for aggressiveness either at 4300 or 1600 m (Figure 2).

Unhappiness ratings, shown in Figure 2, showed only one difference. At 4300 m, subjects felt less unhappy (i.e., more happy) on day 0 ( $p \leq .005$ ) than at 200 m. No differences in unhappiness were seen at 1600 m.

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Figure 2 about here  
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Thus, at 4300 m, subjects became less friendly, less clear thinking, and less unhappy. They also became more dizzy and more sleepy, while aggressiveness stayed the same. At 1600 m subjects became more sleepy. However, 42 - 52 hours (day 2) after ascent, all changes had returned to baseline values. No morning - evening differences were found at 200, 1600, or 4300 m, except on the sleepiness factor at 4300 m.

#### DISCUSSION

This data showed that only one mood factor changed at 1600 m but several mood factors were affected at 4300 m. Moreover, mood factors changed distinctively with time at altitude, while morning - evening moods were similar at altitude and sea level. These findings suggest that time of day need not be a major consideration in administering the Clyde Mood Scale during altitude studies.

No mood changes, except increased sleepiness, were observed at 1600 m. Armstrong (15) noted that sleepiness was the most frequent symptom occurring at an altitude of 3700 m. However, at 4300 m, sleepiness was third in

occurrence and at 4900 m it was fifth in occurrence. These findings suggest that sleepiness may be the predominate symptom experienced at lower altitudes but at higher altitudes it seems less significant compared to other symptoms. Our finding is also noteworthy because no other changes in mood were observed at 1600 m. These results suggest that people flying on pressurized aircraft or traveling to 1000 - 2000 m for work, recreation, or residence will experience few mood changes other than increased sleepiness (fatigue).

Five of the six factors on the Clyde Mood Scale were significantly different from baseline at 4300 m on day 0. This finding is important since these administrations were given only 1 and 4 hours after ascent to altitude. Thus, it appears that the Clyde Mood Scale can be used to measure mood changes during the first few hours of hypoxic exposure in high altitude studies, which is important since many of these studies are of short duration (3,8).

All mood changes at 4300 m appeared greatest on day 1, 18 - 28 hours after ascent to altitude, except for sleepiness. This mood factor appeared greatest 1 - 4 hours after ascent at both 1600 and 4300 m. This finding supports the description of "high-altitude disease" by Monge, which states that the first symptom to appear at altitude is a feeling of generalized fatigue, which bears no relation to the amount of work performed (15). At 4300 m, all mood changes had recovered to baseline values by day 2, 42 - 52 hours after ascent. At 1600 m, all mood changes had recovered to baseline values by day 1, 18 - 28 hours after ascent. This finding matched the timecourse of AMS symptomatology reported previously (7).

The Clyde Mood Scale detected changes in mood over time at altitude. Our results, showing the most severe mood changes occurred 1 - 2 days (18 - 52 hours) after altitude ascent and then gradually subsided over the next 2 - 4 days, support previous research with AMS symptomatology. Banderet (1) found that this mood scale was also sensitive to changes produced by the treatment strategy (staging plus acetazolamide); this strategy resulted in improved

moods at altitude. At 4300 m, subjects in the treatment group rated themselves as more friendly and less dizzy and sleepy than the control group subjects. Since the Clyde Mood Scale appears sensitive to high altitude effects, as well as treatment effects, it can be used in future high altitude studies as a subjective measure for mood.

This study confirmed the hypothesis that moods change at high altitude with time. Mood changes showed a distinctive time course that paralleled the symptom time course at altitude. Five of the six mood factors measured by the Clyde Mood Scale were affected as early as 1 and 4 hours after ascent to 4300 m and had recovered by 42 - 52 hours. Only one mood factor, sleepiness, was affected at 1600 m. No time of day effects (morning - evening) were found at 200, 1600, or 4300 m, except on the sleepiness factor at 4300 m. Therefore, moods are affected by both the level of altitude and duration at altitude.

#### REFERENCES

1. Banderet LE. Self-rated moods of humans at 4300 m pretreated with placebo or acetazolamide plus staging. *Aviat. Space Environ. Med.* 1977; 48(1):19-22.
2. Banderet LE, Shukitt BL, Kennedy RS, Houston CS, Bittner AC Jr. Cognitive performance and affective responses during a prolonged ascent to 7600 m (25,000 ft) simulated altitude. (Submitted for review).
3. Cain SM, Dunn JE II. Low doses of acetazolamide to aid accommodation of men to altitude. *J. Appl. Physiol.* 1966; 21(4):1195-200.
4. Carson RP, Evans WO, Shields JL, Hannon JP. Symptomatology, pathophysiology, and treatment of acute mountain sickness. *Fed. Proc.* 1969;

28(3):1085-91.

5. Clyde DJ. Manual for the Clyde Mood Scale. Biometric Laboratory, University of Miami, Coral Gables, Fl., 1963.

6. Evans WO. Measurement of subjective symptomatology of acute high altitude sickness. Psychol. Rep. 1966; 19:815-20.

7. Evans WO, Robinson SM, Horstman DH, Jackson RE, Weiskopf RB. Amelioration of the symptoms of acute mountain sickness by staging and acetazolamide. Aviat. Space Environ. Med. 1976; 47(5):512-6.

8. Fine BJ, Kobrick JL. Effects of altitude and heat on complex cognitive tasks. Hum. Fact. 1978; 20(1):115-22.

9. Forward SA, Landowne M, Follansbee JN, Hansen JE. Effect of acetazolamide on acute mountain sickness. New Eng. J. Med. 1968; 279(16):839-45.

10. Hansen JE, Harris CW, Evans WO. Influence of elevation of origin, rate of ascent and a physical conditioning program on symptoms of acute mountain sickness. Milit. Med. 1967; 132(8):585-92.

11. Houston CS. Going Higher: The Story of Man and Altitude. Burlington: Charles S. Houston, M.D., 1983.

12. Kobrick JL, Sampson JB. New inventory for the assessment of symptom occurrence and severity at high altitude. Aviat. Space Environ. Med. 1979; 50(9):925-9.

13. Sampson JB, Kobrick JL. The Environmental Symptoms Questionnaire: Revisions and new field data. *Aviat. Space Environ. Med.* 1980; 51(9):872-7.

14. Stamper DA, Kinsman RA, Evans WO. Subjective symptomatology and cognitive performance at high altitude. *Percept. & Mot. Skills* 1970; 31:247-61.

15. Van Liere EJ, Stickney JC. Hypoxia. Chicago: The University of Chicago Press, 1963.

16. Ward N. Mountain Medicine. London: Crosby Lockwood Staples, 1975.



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2. Human subjects participated in these studies after giving their free and informed voluntary consent. Investigators adhered to AR 70-25 and USAMRDC Regulation 70-25 on Use of Volunteers in Research.

TABLE I

MORNING - EVENING MEAN FACTOR SCORES FOR 200, 1600 &amp; 4300 M

	DAY 0		DAY 1		DAY 2		DAY 3	
	AM	PM	AM	PM	AM	PM	AM	PM
FRIENDLINESS								
200	56.32	58.44	54.08	57.16				
1600	56.70	54.19	54.63	56.27				
4300	49.50	48.59	43.18	46.28	53.43	53.67	54.00	55.94
CLEAR THINKING								
200	52.70	53.07	53.54	53.74				
1600	53.11	50.85	49.48	50.33				
4300	47.12	48.32	47.24	47.71	49.56	50.20	47.70	51.87
DIZZINESS								
200	46.53	43.92	43.32	44.60				
1600	46.96	48.64	47.10	47.03				
4300	58.93	60.88	64.96	56.79	51.28	53.69	50.01	49.94
SLEEPINESS								
200	49.56	49.68	55.19	50.24				
1600	54.11	57.03	56.27	54.68				
4300	67.04	65.95	65.69	62.58	56.38	55.64	57.03	47.88
AGGRESSIVENESS								
200	51.44	52.33	51.52	52.38				
1600	50.29	48.24	48.48	49.29				
4300	51.71	48.38	49.07	49.28	49.13	48.66	48.22	50.66
UNHAPPINESS								
200	47.86	47.70	45.77	45.83				
1600	45.88	44.47	43.19	45.32				
4300	42.44	43.44	44.16	45.26	42.62	43.01	43.47	42.53

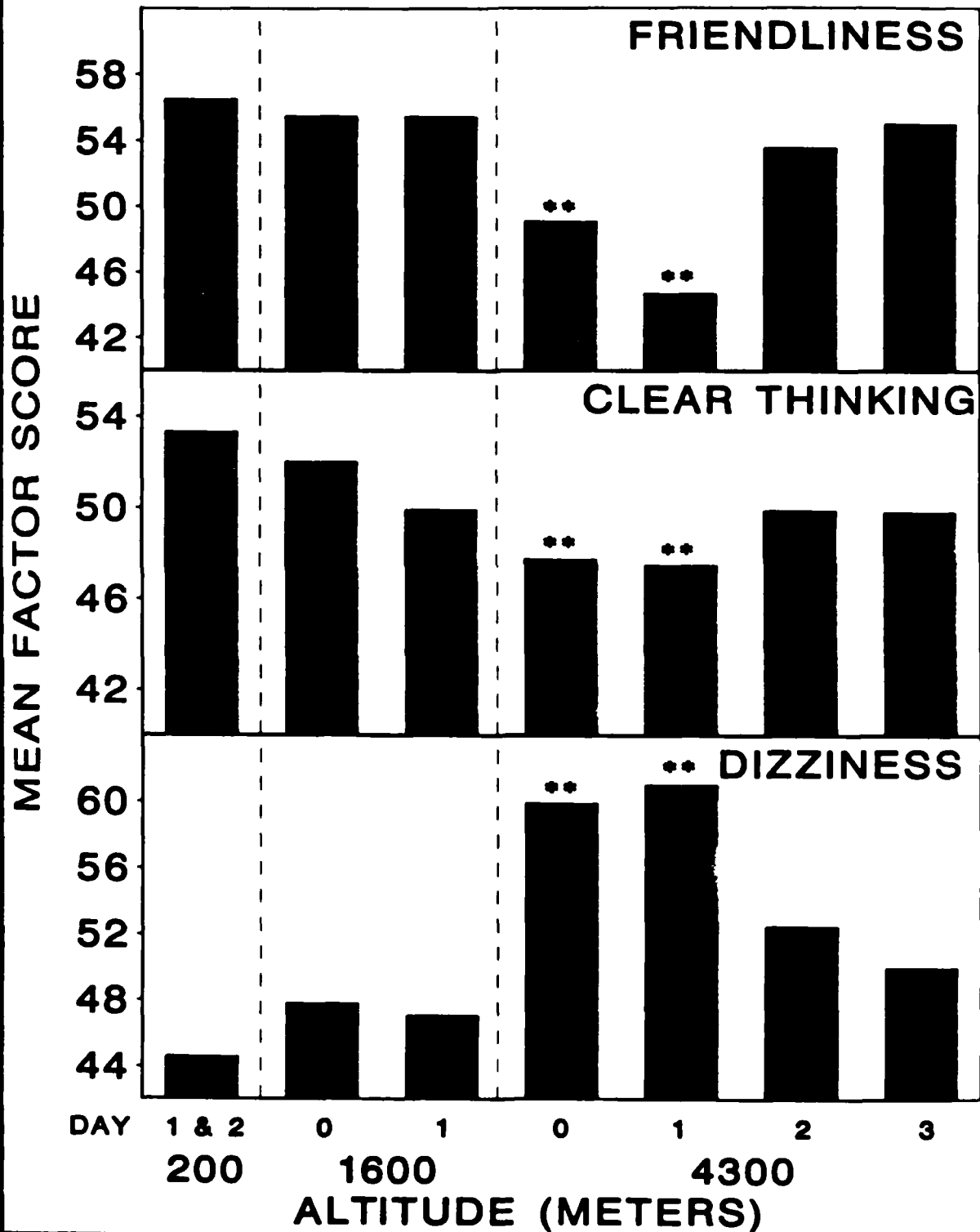
## FIGURE CAPTIONS

Figure 1. Factor scores for friendliness, clear thinking, and dizziness at 200, 1600, and 4300 m. A double asterisk indicates a significant difference from 200 m at  $p \leq .01$ .

Figure 2. Factor scores for sleepiness, aggressiveness, and unhappiness at 200, 1600, and 4300 m. A double asterisk indicates a significant difference from 200 m at  $p \leq .01$ .

# MOOD AT VARIOUS ALTITUDES

## CLYDE MOOD SCALE



# MOOD AT VARIOUS ALTITUDES

## CLYDE MOOD SCALE



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